Universality of the High Temperature Viscosity Limit of Glass-Forming Liquids

Zheng, Qiuju; Mauro, J. C.; Ellison, A. J.; Potuzak, M.; Yue, Yuanzheng

American Ceramic Society, GOMD Annual Meeting, Savannah, USA, May 15-19, 2011

Universality of the High Temperature Viscosity Limit of Glass-Forming Liquids

Qiuju Zheng[1,2], John C. Mauro[2], Adam J. Ellison[2], Marcel Potuzak[2], Yuanzheng Yue[1,3]

[1]*Section of Chemistry, Aalborg University, DK-9000 Aalborg, Denmark*
[2]*Science and Technology Division, Corning Incorporated, Corning, New York, USA*
[3]*Taishan Laboratory, Shandong Institute of Light Industry, Jinan, China*

We fit viscosity measurements for over one thousand glass-forming liquids to three viscosity models: VFT, AM and MYEGA. Based on these results, we conclude that the universal viscosity limit of glass-forming liquids at high temperature is $10^{-2.93}$ Pa· s, independent of composition. The glass-forming liquids include silicate, borate, metallic, molecular, and ionic liquids, which proves the universality of this value. With knowledge of this universal high temperature viscosity value, the fitting process is simplified since there are only two free parameters in any viscosity model. This value makes physical sense since it is determined by the liquid quasilattice vibration time ($\tau_\infty \approx 10^{-14}$ s), which is the time between successive assaults on the rearrangement energy barrier.